



Review Article

MITIGATING MALNUTRITION IN RURAL INDIA: A CIVIL ENGINEERING APPROACH FOR HEALTH AND NUTRITION ENHANCEMENT

Mohammed Yunus A H¹, Amarnath B V² and N Venkata Ramana³

M.Tech (CADS), Department of Studies in Civil Engineering, University BDT College of Engineering, Davangere, Karnataka, India .

ARTICLE INFO

Article History:

Received 14th July, 2024
Received in revised form 25th July, 2024
Accepted 12th August, 2024
Published online 28th August, 2024

Key words:

Malnutrition, Rural Areas, India, Civil Engineering, Health, Nutrition

ABSTRACT

Malnutrition persists as a significant public health concern in rural India, with detrimental impacts on community well-being and socio-economic development. This project explores the potential of civil engineering-driven solutions to address malnutrition challenges by focusing on integrated infrastructure development. Through a multi-disciplinary approach, the project aims to enhance health and nutrition outcomes in rural communities by improving access to essential services, promoting sustainable agriculture, and building resilience to environmental stressors.

Key components of the project include the establishment of water supply and sanitation systems to ensure access to clean drinking water and sanitation facilities, the development of transportation networks to facilitate the distribution of nutritious foods and essential resources, and the implementation of renewable energy technologies to support agro-processing activities and enhance energy access. Additionally, the project emphasizes the importance of community engagement, capacity building, and knowledge exchange to empower local stakeholders in the design, implementation, and maintenance of infrastructure solutions tailored to their needs and priorities.

Copyright© The author(s) 2024, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Malnutrition refers to a condition where an individual's diet doesn't provide enough nutrients for proper growth, development, and maintenance of healthy body functions. It can manifest as undernutrition, where there's a deficiency of essential nutrients, or overnutrition, where there's an excess of certain nutrients, often accompanied by insufficient intake of others. Undernutrition typically leads to stunted growth, weakened immune system, and cognitive impairment, among other health issues. Overnutrition, on the other hand, often results in obesity and related health problems such as diabetes and cardiovascular diseases.

Malnutrition can occur due to various factors including poverty, limited access to nutritious food, inadequate breastfeeding practices, food insecurity, and certain medical conditions. It affects people of all ages but is particularly critical in children,

as it can have long-lasting effects on their physical and cognitive development.

Global Hunger Index

The Global Hunger Index (GHI) is a tool for comprehensively measuring and tracking hunger at global, regional, and national levels. GHI scores are based on the values of four component indicators:

Table with 4 columns: Undernourishment, Child stunting, Child wasting, Child mortality. Each column contains an icon and a list of key points describing the indicator.

Fig 1 Four Indicators Underlying the GHI Capture the Multidimensional Nature of Hunger

*Corresponding author: Mohammed Yunus A H

M.Tech (CADS), Department of Studies in Civil Engineering, University BDT College of Engineering, Davangere, Karnataka, India .



Fig 2 GHI Severity of Hunger Scale

Table 1 GHI Rankings 2023

Ranking based on 2023	Country	2000	2008	2015	2023
Top – 5 Ranked Countries					
01	Belarus	<5	<5	<5	<5
02	Bosnia & Herzegovina	9.4	6.5	5.3	<5
03	Chile	<5	<5	<5	<5
04	China	13.4	7.1	<5	<5
05	Croatia	<5	<5	<5	<5
Where India Stands					
111	India	38.4	35.5	29.2	28.7
Bottom – 5 Ranked Countries					
121	Lesotho	32.5	27.8	30.6	35.5
122	Dem. Rep. of the Congo	46.3	40.2	36.4	35.7
123	Yemen	41.4	37.8	42.1	39.9
124	Madagascar	42.4	36.6	38.9	41.0
125	Central African Republic	48.2	43.7	44.0	42.3

Malnutrition in Rural India

According to the 2023 State of Food Security and Nutrition in the World (SOFI) report, 16.6% of India’s population is undernourished. This is an increase from 14% in 2015. The report also states that India’s child wasting rate is 18.7%, the highest among all countries in the report.

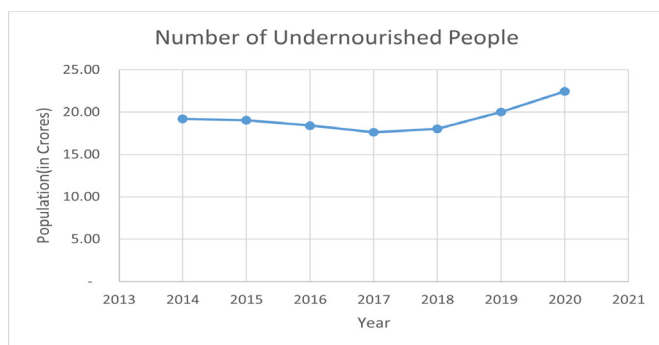


Fig 3 Number of Undernourished People

Considering the nourishment of men and women in rural and urban India side by side, a disparity becomes evident. The data below is extrapolated from the fourth and fifth National Family Health Surveys. An analysis of the number of deaths of children under the age of five was conducted to examine the trend from 2014 to 2021, [using datasets from the World Bank](#).

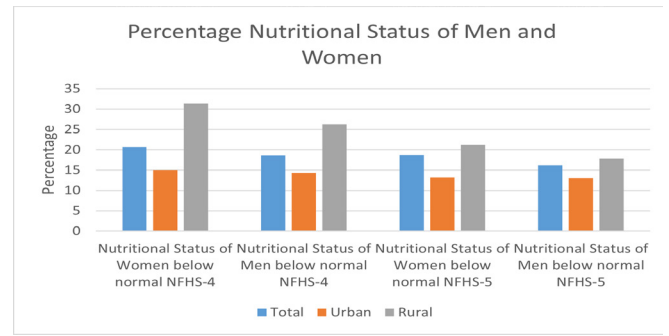


Fig 4 Percentage Nutritional Status of Men and Women

The nutritional status from fourth and fifth National Health and Family Surveys from 2015 – 2016 and 2019 – 2021 point to a noticeable discrepancy in nutrition levels, particularly between rural and urban areas. The nutritional status indicators calculate, for adults between the age of 15-49, body mass index or BMI, overweight and obesity among respondents and high-risk waist to hip ratio. The data indicates that undernourishment is more prevalent in rural areas than in metropolitan areas.

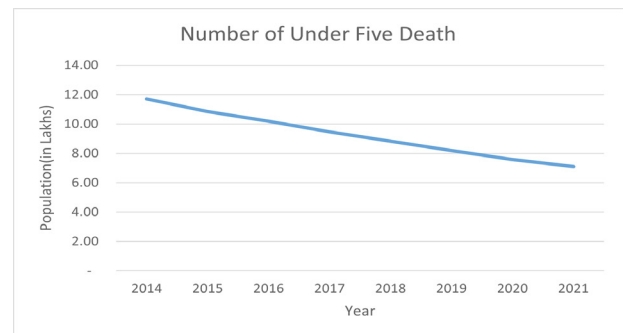


Fig 5 Number of under Five Death

The graph shows a decline in India’s child mortality rate from 11 lakh in 2014, to 7 lakhs in 2021, a significant decrease of around 39%.

Malnutrition in Children

Every child has the right to good nutrition. Well-nourished children grow and develop to their full potential. They are better equipped to lead healthy lives, to be free from poverty, to learn and participate, and to continue thriving across the life course, with benefits that continue over generations. The past two decades have seen important gains in improving maternal and child nutrition, including a one-third decline in the proportion of children suffering from stunting. Yet the triple burden of malnutrition – stunting, wasting and overweight – continues to jeopardize children’s ability to survive and thrive.

Defining the forms of malnutrition* highlighted in this key findings report

Stunting refers to a child who is too short for his or her age. Children affected by stunting can suffer severe irreversible physical and cognitive damage that accompanies stunted growth. The devastating consequences of stunting can last a lifetime and even affect the next generation.

Wasting refers to a child who is too thin for his or her height. Wasting is the result of recent rapid weight loss or the failure to gain weight. A child who is moderately or severely wasted has an increased risk of death, but treatment is possible.

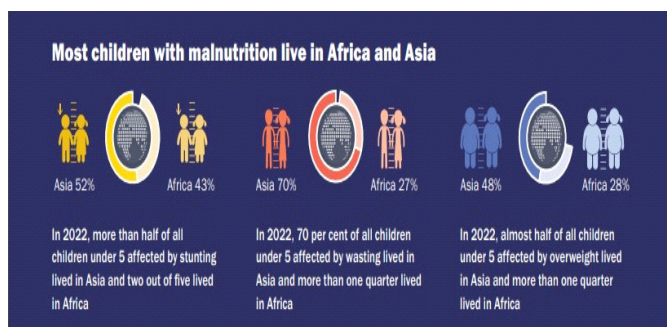
Overweight refers to a child who is too heavy for his or her height. This form of malnutrition results when energy intakes from food and beverages exceed children’s energy requirements. Overweight increases the risk of diet-related noncommunicable diseases later in life.

* Some children suffer from more than one form of malnutrition – such as **stunting and overweight or stunting and wasting**. There are currently no joint global or regional estimates for these combined conditions.

Fig 6 Forms of Malnutrition

Table 3 Details of funds released and utilised under POSHAN Abhiyaan & ICDS scheme

Scheme	Total Central Funds released from FY 2018-19 to FY 2020-21	Total Central Funds utilization as on 31st March 2021
POSHAN Abhiyaan	4,66,824.80	2,98,555.92
ICDS	26,10,031.55	25,36,780.66

**Fig 7** Global Data on Malnutrition

Malnutrition Free India

State/UT wise details of malnourished children (stunted, wasted and underweight) under 5 years and malnourished women (aged 15-49 years) as per the National Family Health Survey. Malnourishment in children (stunting, wasting and underweight) under 5 years has reduced as per NHFS-5 (2019-21) from 38.4% to 35.5%, 21.0% to 19.3% and 35.8% to 32.1% respectively as compared to NHFS-4 (2015-16).

Table 2 Malnutrition in Children (India and It's Neighbouring Countries)

Country	Stunting (Percent)			Overweight (Percent)			Wasting (Percent)		
	2012 Value	2022 Value	Thresh-old	2012 Value	2022 Value	Thresh-old	Year	Value	Thresh-old
India	41.6	31.7	Very high	2.2	2.8	Low	2020	18.7	Very high
Bangladesh	39.2	26.4	High	1.8	2.1	Very low	2019	9.8	Medium
China	7.6	4.6	Low	7.0	8.9	Medium	2017	1.9	Very low
Nepal	40.3	26.7	High	1.2	1.7	Very low	2022	7.7	Medium
Pakistan	43.8	34.0	Very high	4.6	2.7	Low	2018	7.1	Medium
Sri Lanka	16.7	15.9	Medium	1.2	1.3	Very low	2016	15.1	Very high

Malnutrition among women aged 15-49 years has also reduced from 22.9% to 18.7%. Details of funds released and utilised under POSHAN Abhiyaan & ICDS scheme from FY 2018-19 to 2020-21 are as follows:

Further, POSHAN Abhiyaan launched on 8th March 2018, aims to achieve improvement in nutritional status of Adolescent Girls, Pregnant Women and Lactating Mothers in a time bound manner by adopting a synergised and result oriented approach. Mission Poshan 2.0, an integrated nutrition support programme has been announced in budget 2021-2022 for all States/UTs. It seeks to strengthen nutritional content, delivery, outreach and outcomes with focus on developing practices that nurture health, wellness and immunity to disease and malnutrition. Steps have been taken to improve nutritional quality and testing in accredited labs, strengthen delivery and leverage technology under Poshan Tracker to improve governance. States/UTs have been advised to promote use of AYUSH systems for prevention

of malnutrition and related diseases. A programme to support development of Poshan Vatikas at Anganwadi Centres to meet dietary diversity gap leveraging traditional knowledge in nutritional practices has also been taken up. Guidelines were issued for transparency and accountability in delivery of supplementary nutrition and to track nutritional outcomes on 13.01.2021.

This information was given by the Union Minister of Women and Child Development, Smt. Smriti Zubin Irani, in a written reply in Rajya Sabha

OBJECTIVES

- Assess the current state of malnutrition in rural India and the measures implemented to combat it.
- Propose Civil Engineering-driven solutions to address malnutrition challenges prevalent in rural regions.

CIVIL ENGINEERING SOLUTIONS

Malnutrition remains a pressing challenge in rural areas, often exacerbated by factors such as limited access to

nutritious food, inadequate infrastructure, and environmental constraints. Civil engineering offers innovative solutions to tackle these challenges and improve nutritional outcomes in rural communities. Here are some proposed civil engineering-driven solutions:

Improved Agricultural Infrastructure

- Construct irrigation systems, water storage facilities, and drainage networks to enhance agricultural productivity and ensure consistent water supply for crop cultivation.
- Develop sustainable farming practices, such as terracing and contour ploughing, to prevent soil erosion and optimize land use in hilly or sloped terrains.

Road and Transportation Networks

- Upgrade rural road networks to improve accessibility to

markets, healthcare facilities, and educational institutions, facilitating the transportation of nutritious foods and essential resources.

- Construct bridges and river crossings to connect isolated communities and reduce travel times, enabling farmers to access larger markets and diversify their produce.

Disaster Resilience and Climate Adaptation

- Design resilient infrastructure solutions, such as flood protection measures and landslide mitigation structures, to safeguard agricultural assets and livelihoods against natural hazards and climate variability.
- Promote climate-smart agriculture practices, including

Table 4 State/UT wise prevalence of stunting, wasting and underweight among children under 5 years

Sl. No.	State/UT	Stunting (%)		Wasting (%)		Underweight (%)	
		NHFS 4 (2015-16)	NHFS 5 (2019-21)	NHFS 4 (2015-16)	NHFS 5 (2019-21)	NHFS 4 (2015-16)	NHFS 5 (2019-21)
01	Bihar	48.3	42.9	20.8	22.9	43.9	41
02	Jharkhand	45.3	39.6	29	22.4	47.8	39.4
03	Uttar Pradesh	46.3	39.7	17.9	17.3	39.5	32.1
04	Gujarat	38.5	39	26.4	25.1	39.3	39.7
05	Karnataka	36.2	35.4	26.1	19.5	35.2	32.9
06	Chandigarh	28.7	25.3	10.9	8.4	24.5	20.6
07	Goa	20.1	25.8	21.9	19.1	23.8	24
08	Kerala	19.7	23.4	15.7	15.8	16.1	19.7

Food Storage and Preservation Facilities

- Build cold storage warehouses, grain silos, and drying facilities to prevent post-harvest losses and extend the shelf life of perishable foods.
- Implement solar-powered refrigeration systems and food processing units to support small-scale farmers and agro-based enterprises in rural areas.

Water and Sanitation Infrastructure

- Install community water supply systems, hand pumps, and rainwater harvesting structures to improve access to clean drinking water and sanitation facilities.
- Promote hygiene education and behaviour change interventions to reduce waterborne diseases and improve overall health outcomes, particularly among children and vulnerable populations.

Renewable Energy Solutions

- Deploy off-grid solar power systems to electrify rural households and support sustainable energy access for cooking, lighting, and small-scale agro-processing activities.
- Integrate renewable energy technologies, such as biogas digesters and biomass boilers, into agricultural value chains to enhance energy efficiency and reduce greenhouse gas emissions.

drought-resistant crops and agroforestry systems, to enhance food security and resilience to climate change impacts.

CONCLUSION

The data collected reveals the current state of malnutrition in rural India and the measures implemented by both Central and State Governments to address this issue. It highlights the importance of infrastructure development, sustainable agriculture, and disaster resilience. Civil engineering-driven solutions present promising strategies to tackle malnutrition challenges in rural areas, ultimately improving nutritional outcomes for vulnerable populations.

References

1. Global Hunger Index Synopsis – The Power of Youth in Shaping Food Systems (October – 2023).
2. Levels and trends in child malnutrition a report by UNICEF / WHO / World Bank Group – Joint Child Malnutrition Estimates (Key findings of the 2023 edition).
3. Update on the prevalence of malnutrition among children in Asia by Geok Lin Khor (2004)
4. Malnutrition among under-five children in India and strategies for control by Sahu SK, Kumar SG, Bhat BV (2015)
5. <https://www.onefivefive.com/india/villages>
6. <https://villageinfo.in/karnataka>
7. https://en.wikipedia.org/wiki/Malnutrition_in_India
8. <https://pib.gov.in/PressReleasePage.aspx-?PRID=1781673>

How to cite this article:

Mohammed Yunus A H , Amarnath B V , N Venkata Ramana (2024) Mitigating malnutrition in rural India: a civil engineering approach for health and nutrition enhancement, *International Journal of Current Advanced Research*, 13(08), pp.3216-3219
